

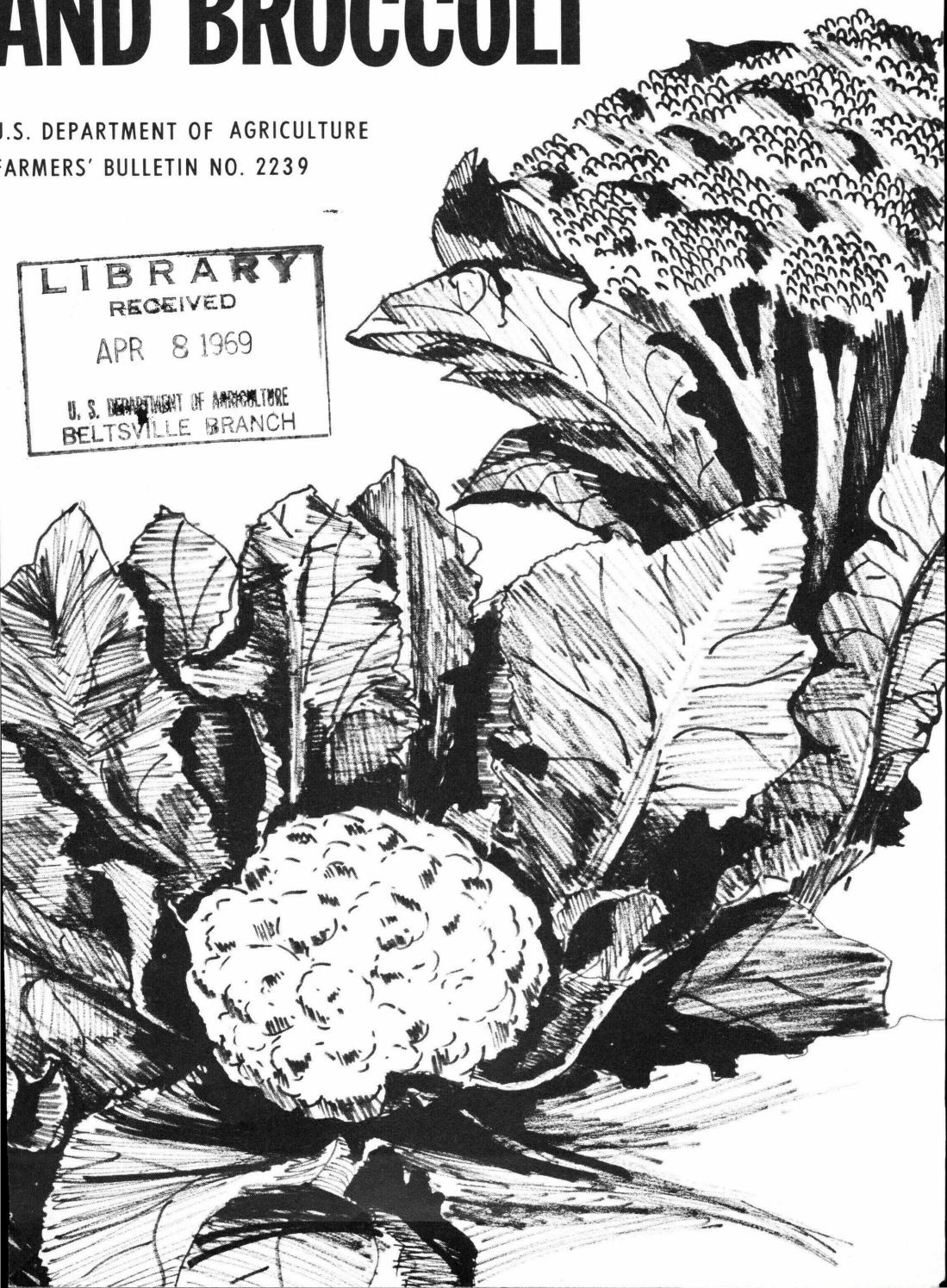
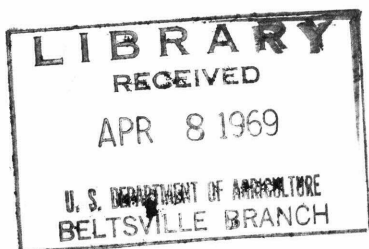
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GROWING CAULIFLOWER AND BROCCOLI

U. S. DEPARTMENT OF AGRICULTURE
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GROWING CAULIFLOWER AND BROCCOLI

Cauliflower and broccoli are popular members of the cabbage family.

There are two types of broccoli—heading and sprouting. The curd (head) of heading broccoli is white and compact, like cauliflower. Heading broccoli takes longer to mature than cauliflower, however. Sprouting broccoli has green heads that are branched, rather than compact.

In this publication “cauliflower” refers to both cauliflower and heading broccoli; “broccoli” refers only to sprouting broccoli.

GENERAL NEEDS AND ADAPTATION

Cauliflower is difficult to grow. It needs—

- fertile, moist soil, rich in organic matter and nitrogen;
- good drainage;
- a cool, humid climate; and
- a frost-free growing season.

Cauliflower grown on light soil must be kept well watered.

Because its needs are so precise, cauliflower is grown in only a few areas, chiefly in Long Island and in western New York, in the Colorado mountains, and on the Washington and California coasts. Small amounts are grown elsewhere.

Broccoli's requirements are similar to those of cauliflower, but it is not as exacting and thus can be grown in a much wider area. Much of the broccoli grown in the Southern and South Atlantic States is shipped to northern markets.

Because frozen broccoli keeps well in storage, it can be shipped long distances. This has opened up new markets.

VARIETIES

Cauliflower

Cauliflower varieties are not well defined. Strains within a variety differ in plant size, in foliage, and in how the inner leaves protect the developing curd from discoloration by sunlight. Poor strains are apt to develop small leaves that extend through the curd, lowering market value.

To make sure you get a good strain, buy high-grade seed from a reputable dealer. Good yields more than make up for the extra expense of good seed.

Here are descriptions of some typically good varieties, from earliest to latest:

Early Snowball does well in areas with a short growing season. It ma-

tures in 50 to 60 days, and is the most important short-season variety. Plants are dwarf, compact, and fast growing. The leaves are medium green and grow upright, turning outward at the tips. The curd is uniform, solid, and ivory white. It has excellent flavor and quality.

Super Snowball is good for canning or freezing. It matures in 55 to 60 days. The plants are dwarf and the leaves are blue green, long, and spreading. The curd is solid and white.

Snowdrift is large and vigorous. The curd is large, free of leaflets, and well protected by the inner leaves during its early development. It matures in 60 to 65 days.

Danish Giant, also called *Dry Weather*, grows well in drier climates. It is grown mainly in the Midwestern States. The curd is white and large, averaging about 7 inches across. It matures in 70 to 80 days.

Winter cauliflowers take up to 150 days to mature. They are grown mainly on the California coast, where the growing season is very long. Varieties are available for planting on definite dates from June to November for harvest from November to May. Some of the best, from the earliest to latest, are: *Early Pearl*, *Christmas*, *February*, *March*, *St. Valentine*, and *Late Pearl*. Names of the varieties reflect the harvest dates.

Broccoli

Most American-grown broccoli is of the Italian Green type called Calabrese (fig. 1).

New varieties are being developed to meet increasing demands. Some are especially adapted to specific areas. Others are suited for freezing.

Here are some of the best:

Atlantic can be planted densely for a high per-acre yield. Plants are dwarf and compact, with fast-developing heads that are medium to large, round, and compact. It is a distinctive short-season type suited for a fall harvest in the Northeastern Atlantic Coast States.

Coastal is an early variety grown in the Far West. Plants are very short and compact. There is little division among clusters in the head. The buds are small, with a good, lasting color. Since the heads are rather uniform, they can be harvested in only three or four cuttings.

DeCicco is a popular early Calabrese variety. It is very productive, with many side shoots that are good for freezing. Plants are light green and medium tall. It will grow in spring, summer, and fall.

Green Sprouting Medium is the most important shipping and freezing variety. It is a mid-season Calabrese, grown mainly on the Pacific coast and in the Southwest. It is too late for the Northern and Eastern States. Plants are large and vigorous, with large, compact central heads and a heavy yield of side heads after central heads are harvested.

Green Sprouting Late, a long-season Calabrese, is grown mainly in California for early spring harvest. It would probably grow well in the South Atlantic States, too, but it is not grown there at present.

Waltham 29 can be grown in many regions, but is particularly suited for the Northeastern and Atlantic Coast States for fall harvesting. It is short season, blue green, and uniform. Plants are stocky with large, broad central heads. They develop many side heads that are good for freezing.

FERTILIZER

Cauliflower needs a lot of fertilizer. Here is an example of what 1 acre might require :

A green-manure crop and 1,000 to 1,500 pounds of complete fertilizer containing 4 to 6 percent nitrogen, 8 to 10 percent phosphorus, and 5 to 7 percent potassium. Supple-



Figure 1.—Head of broccoli ready for harvest.

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ment with one or two side dressings of 150 to 200 pounds nitrate of soda, ammonium nitrate, or sulfate of ammonia per acre.

If you do not use a green-manure crop, you may need 1,000 to 3,000 pounds of complete fertilizer per acre for cauliflower.

If the soil is very acid, apply 1,500 to 2,000 pounds of lime per acre, well in advance of planting.

Combat nitrogen deficiency by growing legumes in rotation with the cauliflower or broccoli, or apply nitrogen fertilizer. Use nitrate of soda if the soil is acid. Nitrogen deficiency can cause "buttons"—small, premature heads—particularly in cauliflower. This is common in the Western States. (Lack of water or poor drainage can also cause buttons.)

Have the soil tested for boron, manganese, and magnesium. If deficiency symptoms appear, consult your county agricultural agent or the soils specialist at your State agricultural college.

Discolored, pithy cores are a sign of boron deficiency. Discolored, deformed curds appear in cauliflower. In broccoli, an early symptom is browning of the florets.

In both manganese and magnesium deficiencies, the older leaves lose their green color, except for the veins.

STARTING THE PLANTS

When to plant cauliflower and broccoli depends on the area, how long the variety takes to mature, and when you plan to harvest.

Cauliflower and broccoli can be planted from mid-April to late fall

in California for a long harvest, but in the Eastern States they must be planted in time for a summer or fall harvest.

In most of California, mild climate permits growing all seedlings in open beds for transplanting to the field. Elsewhere, this is done for summer and fall crops only, and plants for spring harvest must be started in hotbeds or greenhouses. Seedlings need a loose, easily pulverized loam that is not too fertile. Avoid soil that tends to crust on top.

If plants are started in open beds, plant the seed thinly in rows 12 to 14 inches apart. It is best to use a seeder. If the seed is broadcast, weed control is difficult. Cover lightly with one-quarter to one-half inch of soil.

If you start plants under glass, you may sow the seed in rows or broadcast it. Sow thinly so seedlings have room to develop. Thin when they reach the four-leaf stage; allow 2 inches between plants. Leave them to grow until field conditions permit transplanting.

With proper handling, 3 to 4 ounces of seed will produce enough seedlings to plant 1 acre; 1 ounce of seed will produce about 3,000 plants.

If beds or flats have been used for other plants in the cabbage family, be sure they are free of club-root, blackleg, black rot, ring spot, and damping-off. These diseases can remain in the soil. (See Seedbed sanitation, p. 12.)

If weather permits, either cauliflower or broccoli may be started in the field. Set the seeder to drop three or four seeds in one place. Be

sure to thin early to avoid overcrowding.

TRANSPLANTING TO THE FIELD

Plants are transplanted to the field by hand in the West and in many of the small plantings in the East. Many large growers in the East use plant-setting equipment that also waters each plant.

Set plants in rows $2\frac{1}{2}$ to 3 feet apart. Distances between plants in rows vary from about 15 to 36 inches, depending on the variety and strain. In the West, plants are usually spaced rather widely.

Do not set plants until danger of frost is past. In cauliflower, cold causes stunting and premature heading. Broccoli is less sensitive than cauliflower, but frost will damage it.

Avoid planting cauliflower or broccoli in fields planted in cabbage, turnips, kale, and similar crops during the previous 4 or 5 years. All are susceptible to damage by the same diseases and insects.

As the plants grow, cultivate shallowly for weed control or for mulching. Deep cultivation causes root injury, especially late in the season.

Cauliflower needs a lot of moisture for a good yield. Most western growers irrigate. Some eastern growers rely on rainfall, and their crops are often injured by drought.

Broccoli will grow well under drier conditions than cauliflower.

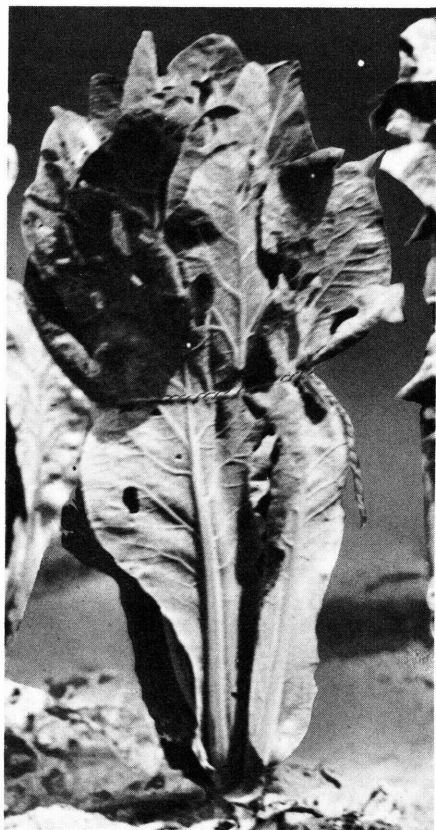
BLANCHING CAULIFLOWER

Exposure to sunlight discolors the cauliflower curd and can produce off-flavors. While curds are still

small, the inner leaves protect them from sunlight. But as the curds grow, in most varieties, they force the inner leaves apart.

Some large, late varieties have very long, upright leaves which protect the curd until it is ready for harvest. Other varieties, like the Snowball types, must be blanched—that is, tied for protection.

To blanch, gather the longest leaves together over the curd and tie them with soft twine, raffia, or tape (fig. 2). Since the plants grow and the curds develop at different rates,



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Figure 2.—Blanching cauliflower to protect the curd.

you must go through the field every 2 or 3 days to tie each plant when the curd begins to show through the small central leaves.

You may want to use twine of a different color each time you go out. In this way, you can tell that heads tied with a certain color will be ready for harvest on approximately the same date.

Broccoli does not need to be blanched.

HARVESTING AND PACKING

Cauliflower

If the weather is warm, heads may mature in as little as 3 to 5 days after blanching. In cooler weather, it may take as long as 2 weeks. The appearance of the curd is the best guide.

Mature heads are fully developed, compact, and clear white. Discolored or overmatured, open heads are not marketable. About 6 inches is the best size at harvest (fig. 3). However, unless the plants are large and very vigorous, delaying your har-

vest won't make small heads grow larger and may result in overmaturity.

Untie and examine a few heads each day to see that they do not overmature. It is better to harvest a little early than too late. You may sacrifice a little in size by cutting early, but you will avoid the quick loss of quality which occurs after the curds mature.

Use a large knife to cut the heads from the plants. Leave one or more sets of leaves attached to protect the curds.

Large producers usually haul cut heads to a central packing shed, where they grade, trim, and pack them. Sometimes, heads are packed in the field.

In California and sometimes in the East, heads are trimmed closely, wrapped in perforated film, and packed in cartons (fig. 4). The film must be perforated to prevent off-colors and off-flavors after the cauliflower is cooked.

In the East, some growers pack unwrapped heads in crates. If you do this, allow a few leaves to remain

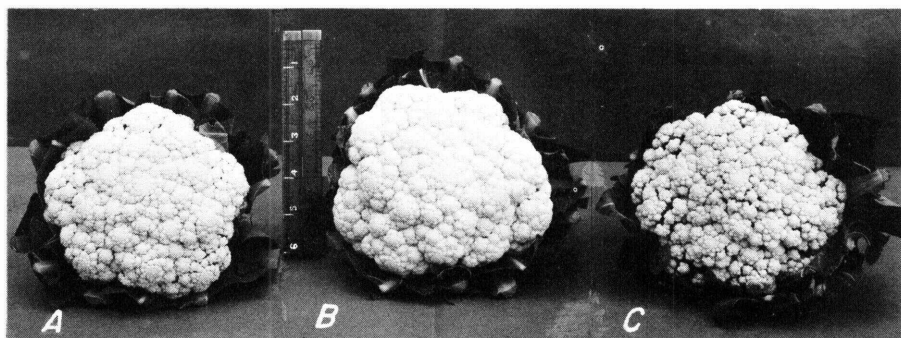


Figure 3.—Head of cauliflower in center is fully developed and at proper stage for harvest. Head on left is slightly overripe but still marketable. Head on right is too ripe to be marketable.

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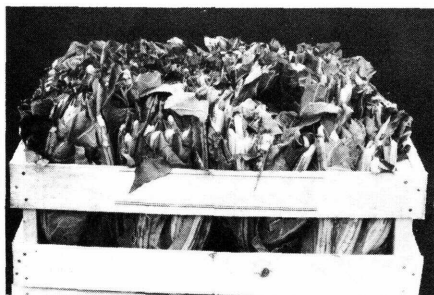


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Figure 4.—Closely trimmed head of cauliflower wrapped in perforated film, with packing carton.

attached, and cut them off just above the head. Leave a jacket of stalks and part of the leaf blades to protect the head (fig. 5).

Cool cauliflower promptly after harvest and keep it refrigerated during shipping and marketing.



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Figure 5.—Heads of cauliflower packed unwrapped in a crate.

Broccoli

Cut broccoli with 8 to 10 inches of stem, before the flower heads open enough to show yellow, as shown in figure 1, page 5. When mature, the central heads are usually 3 to 6 inches across. Overmaturity causes woodiness in the outer stems and lowers market value.

You can sometimes get a second harvest of side heads—shoots that develop after the central head is cut. They measure 1 to 3 inches across. These small heads are very good for freezing.

Tie the cut broccoli in bunches, like asparagus, and pack it in crates, hampers, or wax-impregnated cartons. Side heads may be bunched

separately or combined with central heads that mature at the same time, but combining them with the larger heads will reduce market value of the bunches.

Broccoli is very perishable. It should be cooled promptly after harvest and kept cool during shipping and marketing. Long-distance shipments need package ice and top ice.

DAMAGING INSECTS

Caterpillars

Several species of caterpillars attack cauliflower and broccoli. They injure the plants by eating holes in the leaves, by destroying the growing buds, and by tunneling into the heads of older plants. The most destructive and hardest to control is the cabbage looper (fig. 6). You can recognize it by the way it doubles up (loops) when it crawls or is disturbed.

The cabbage looper, the imported cabbageworm, and the diamondback moth are predominately green. The cabbage webworm, the cross-striped cabbageworm, the corn earworm,

and climbing cutworms are brown, black, or gray, and sometimes have stripes. All are immature stages of moths or butterflies. They are $\frac{1}{3}$ to 2 inches long when full grown.

Aphids

Aphids are tiny, soft-bodied insects that suck plant juices. Infested leaves crumble and curl around the aphids, making them difficult to reach with insecticides (fig. 7). The cabbage aphid is the most destructive aphid pest of cauliflower and broccoli. It is grayish green, about one-sixteenth inch long, and has a waxy, powdery covering on its body (fig. 8).

Cabbage maggot

Cabbage maggots are larvae of small flies that resemble houseflies. The flies lay eggs around plant roots soon after they are set. When the maggots hatch, they chew the stems and bore into the large roots and the lower part of the stalks.

For latest information on controlling cabbage maggots or other insects in your area consult your

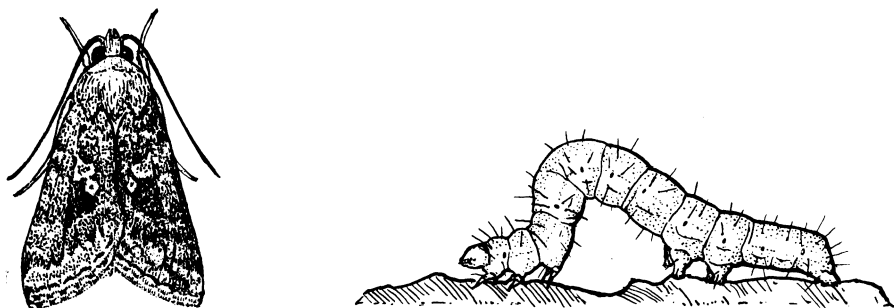


Figure 6.—Adult and larva of the cabbage looper.

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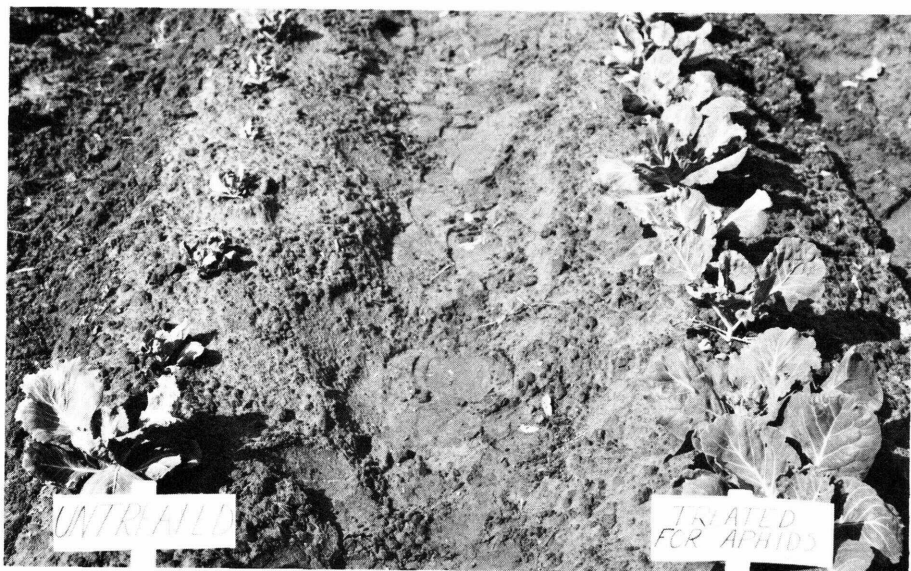


Figure 7.—Cabbage plants showing damage by cabbage aphids to plants on left.

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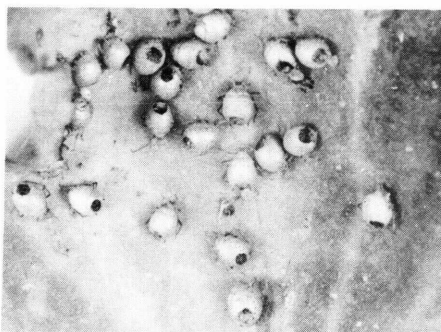


Figure 8.—Left, cabbage aphids feeding. Some near center have been killed by parasites. Right, bodies of aphids that have been killed by parasitic insects.

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county agricultural agent or your State agricultural experiment station.

DISEASE CONTROL

The most serious cauliflower and broccoli diseases are mosaic, black rot, blackleg, clubroot, damping-off, and ring spot.

Disease-free seed

Organisms that cause blackleg and black rot are sometimes found in cauliflower and broccoli seed grown east of the Rocky Mountains. Most of the seed is grown on the Pacific coast, where it is not affected by these diseases. If you cannot be sure of the origin of your seed, pro-

tect against blackleg and black rot with a hot water treatment.

Put the seed in very loose muslin bags and place in water at a constant temperature of 122° F. for 30 minutes. This will reduce germination in old or weak seed; run a test batch first to make sure your seed will stand the treatment. Dusting seed with a seed protectant helps protect seedlings, but it is not a substitute for the hot water treatment. If practicable, use seed from the Pacific coast.

Fungicide dusts will not control blackleg or black rot.

Copper dusts should not be used on broccoli seed.

Seedbed sanitation

Do not use the same soil repeatedly in coldframes or seedbeds, because most disease germs live over in the soil. Rotate outdoor seedbeds and treat soil in hotbeds or cold-

frames by steam sterilization or chemical fumigation.

Mosaic viruses live over in plants, including weeds in the cabbage family, and can be carried to seedbeds by aphids. Do not place seedbeds near weedy borders; keep coldframes free of weeds.

Clean up cabbage, cauliflower, and broccoli remains promptly where ring spot is severe, as in some Pacific coast areas. Spores that are discharged by these remains can be carried by air currents for long distances.

You will find more information on controlling pests and diseases of cauliflower and broccoli in Home and Garden Bulletin 46, "Insects and Diseases of Vegetables in the Home Garden." Send your request on a post card to the Office of Information, U.S. Department of Agriculture, Washington, D.C. 20250. Please include your ZIP code in your return address.